gotten, for it is one of the very best and most efficient means of lowering blood pressure in uremia and allied states; from 16 to 24 ozs. of blood being abstracted, often with the greatest good to the patient.

Iodide of potassium in small doses is a time-honored remedy, but there is no sufficient evidence to show that it is of any especial benefit, except in cases where syphilis plays a role, in which case the iodides are indispensable. Still they do relieve headache and precordial pain, their exact action in accomplishing this not being understood. As they must be given over long periods of time to effect beneficial results, it is always wise to alternate the potassium salt with the less irritating ones of sodium or strontium.

If, as these cases advance, any evidence of failing circulation supervenes, digitalis should be used in exactly the same manner as in a decompensated heart. It should be remembered that digitalis, given by mouth, does not raise blood pressure in such cases, and by relieving cyanosis may actually lower it. When the time comes, however, in which we feel called upon to administer digitalis, our case has passed beyond the realm of this discussion, for we are no longer dealing with arterial hypertension.

A CASE OF ANTHRAX.

By J. C. FALLON, M. D., Reno, Nevada.

In presenting this case I am prompted by the many inquiries I have received from different parts of the State. The inquiries were in turn prompted by the prominence of the patient and the rarity of this disease in the human in this State.

I have incorporated in the report some statistics as to prognosis and treatment which were kindly collected for me by Dr. M. F. Boyd of the University of Nevada, from special literature on the subject to which he has access.

This case was a man forty years of age, with an excellent previous history, and apparently a perfect specimen of physical manhood. He, however, had a mitral regurgitation which was quite pronounced, and which was transmitted to the axilla on the left side. Heart was considerably enlarged downward, and to the left. He did not and never had used alcoholic drinks, but smoked a pipe quite a little. He was a veterinary surgeon, but had been following ranching for several years previous to his death, only two weeks before which time he was appointed state quarantine officer for Churchill county by proclamation of the governor, to investigate the cause of the great mortality among cattle in all sections of that valley.

About noon on August 25, 1914, the patient presented himself to me for diagnosis and treatment. There was an infected wound at the base of the thumb on the left hand, which the patient attributed to the bite of a mosquito while he was irrigating in his field two days previous, and which he said he had "scratched until it bled."

This spot was about the size of a pea, and was black, which color patient attributed to the fact that he had "burned it out with pure carbolic acid." On pressure it exuded a dark serum-like substance. The surrounding area was somewhat hyperemic, the hand was much distorted from the edema, and this edema was peculiar in that it was most severe at points distant from the lesion, i. e., the fingers and palmar surface of the hand. In fact, the swelling caused so much distortion as to make it appear as if the fingers were suffering from a backward dislocation, the hand proper being depressed in comparison. There was no pain. Patient did not feel badly, and was prompted to consult me by the fact that on the 9th of August, some 16 days previous, he had opened the carcass of an animal which had died from an unknown cause, excised a piece of the liver, and sent it to the university for diagnosis, the diagnosis in this case being anthrax. This autopsy was performed without gloves, but patient claimed he had thoroughly disinfected not only his hands, but all the instruments, and clothing he had used or worn on that occasion. Such sterilization of instruments and clothing being accomplished by boiling. He admitted, however, that the overalls he was wearing at the time he thought he was bitten were the same he wore at the autopsy. As that was two weeks previous, and as patient said he had not been in contact with diseased animals since that time, it seemed unreasonable to suspect an incubation period of such length.

At this time pulse was 90, temperature 101.2°, and respiration normal. I cautioned him that it was extremely suspicious, and that while it seemed a rather late infection, it certainly resembled in many particulars malignant pustule. As he was a veterinary and realized the danger from this infection, I had every reason to believe he had as he said, thoroughly opened and cauterized the wound. I advised him to return home at once, and keep his hand bathed constantly in hot creolin solution to promote active drainage, and to notify me at once of any unfavorable change in his condition. He said he did not worry about the hand, but he promised to go home, which, however, he did not do, for I saw him in town as late as 6 o'clock that evening.

The next morning I was summoned to his house, and found no difficulty in making a clinical diagnosis of anthrax. The hand was swollen (uniformly) to the wrist, and the entire dorsal surface was black and tense, with a hyperemic line of demarcation at the wrist, and secondary vesicles surrounding the original lesion and distant from it.

I immediately anesthetized the patient, and excised an area as large as a 50-cent piece, and again thoroughly cauterized with pure carbolic acid. I was convinced at the time, however, that the prognosis was exceedingly grave, and so informed the patient's family.

The temperature at this time was 102.5°, pulse 98, respiration 28. Patient was complaining of extreme pain at the base of the thumb on the palmar surface, which seemed to be due to the tension caused by the extreme edema. He still had a good appetite, had no nausea or vomiting, no headache, was cheerful and not in the least prostrated. At 4 o'clock that afternoon (4th day from time he first noticed hand was sore) his condition was unchanged except for the edema, which was more pronounced, and the pain due to the tension was now so severe that morphine was necessary to alleviate his suffering. Realizing the seriousness of the case I asked for consultation. My consultant, however, assured the patient and his wife that it was merely a bad case of "blood poisoning" and that he was, and would be "all right." Fortunately I had sent two smears to the university for diagnosis. Consultant, however, agreed with treatment, which beside the surgical procedure, consisted of hot fomentations almost continuously, nutritious food, small doses of quinine frequently repeated, and morphine as needed to control pain.

The next morning found quite an extension of the edema, hyperemia, and vesicles. Patient had spent a restless night, had slight nausea, no appe-

tite, some headache, and much pain at base of thumb. Bowels were obstinate and required energetic measures to move them. Temperature was 103.4°, pulse 98, respiration 30. Patient apparently was strong, and when free from pain was cheerful, and not at all worried concerning his condition. In fact another of my colleagues whom I had invited to see the case with me this morning, could see nothing alarming in patient's condition, and so informed patient's wife, seeming to agree with my consultant of the day before, that it was not anthrax.

That afternoon temperature was 104.2°, pulse 102, respiration 34. It was now necessary to keep patient under morphine constantly, as the pain was unbearable. The edema and hyperemia had reached nearly to the elbow, and the entire area was covered with vesicles, amounting to blebs in some instances, and one in the axilla was the size of a small hand. These were opened frequently, but almost immediately reformed. The hand to the wrist was greatly distorted, and intensely black.

On the morning of the next and last day, which was the sixth day from the time patient first had his attention called to the hand by the supposed bite, while the temperature was only 102°, pulse 98, respiration 36, patient presented evidence of severe toxemia, was extremely restless, slightly delirious, was sweating profusely, and pulse was full and bounding. At this time the line of demarcation had reached the elbow, while swelling was quite pronounced over entire left side to below nipple line. It was on this day that the report came from the university that the smear contained anthrax bacilli, with the suggestion that serum be obtained if possible, which had been thought of before, but our local druggist was of the opinion that it was in stock only in the east, and before we discovered our mistake and had obtained it it was too late to use it. I doubt, however, if it could have been obtained early enough after I first saw the case, as there was none in this locality.

That afternoon at 4 o'clock the pain had become so intense that opiates failed to give relief, and patient and his wife both begged me to relieve the tension, which I did with three superficial incisions on the dorsal surface, enlarging the openings thus made with hemostats. The wounds bled freely, the blood being nearly as black as ink, and was with some difficulty controlled, it being finally necessary to bandage hand tightly to control oozing, as the blood would not coagulate. This bleeding seemed to relieve the patient considerably, and in about an hour he sank into a peaceful sleep, from which he never fully aroused, his pulse gradually getting weaker until, for about two hours previous to death, it was not perceptible, and at about which time the temperature per rectum registered 105.4°. Death occurred at 8 o'clock, and came without a struggle of any kind, and so quietly that those present were not aware for some time that the end had come.

In summarizing: The first question that arises in most of our minds is the source of infection. It seems incredible that the incubation period could have been 16 days, as all authorities agree that it is between 36 hours and three days. However, I learned later that the patient had been superintending the burning of carcasses of animals that had died of anthrax just a few days prior to the time of his "mosquito bite." It is not at all improbable that he became infected at that time. Another method of infection could have been from the overalls he was wearing, and which were the same he had worn at the autopsy, as it is well known that the spores withstand boiling for an incredible length of time. The next, and what seems to me the most probable mode of infection, was through improperly cleansed finger nails, the dried blood containing spores remaining beneath them, and as the nails grew, being brought nearer the surface, and when he "scratched his hand until it bled" some of these spores gained access to the wound. The exact method of infection in this case, of course, never will be known, and proves the necessity of extreme caution, when even in a remote way, we are brought in contact with anthrax.

A few words as to diagnosis. Not every one has access to a microscope, and while we are waiting for a return from the laboratory much valuable time is lost. First in importance comes history of possible exposure, and as seen from this case, it is not necessary that it should have been within the incubation period as outlined in our textbooks, which by the way, devote very little space to this rare disease.

To me the most important local symptoms (as told me by patient and as observed) were:

1. The small, red papule (pimple, as the laity call it), to which attention is first called by a stinging, smarting sensation, and not a sensation of pain or soreness, as in ordinary infections.

2. The breaking down of this papule within a very few hours, with the formation of a vesicle (or little water blister, as this patient described it), which upon being opened, discharges a bloody serum—no pus being present. This absence of pus is an extremely valuable aid if the case is seen later, as with the intense reaction one is surprised at the absence of pus, for the first thought on seeing the case will be that there is pus under pressure, and we also wonder at the absence of early pain.

3. The black center in an area of brawny induration and extreme edema, the distortion being out of all proportion to the apparent severity of the infection; and

5. The secondary vesicles, which act so characteristically as to enable one to make the diagnosis almost to a certainty when the above symptoms are not so typical. These vesicles occur in successive crops, becoming larger with each crop, and appear at points distant from the lesion as well as surrounding it.

In this case the local symptoms appeared in rapid succession, and before the constitutional symptoms were at all alarming. But for the fact that the constitutional symptoms in this case were not so early in appearing in their severest form, it presented almost a book picture of a typical

case, and yet two competent physicians did not agree with the diagnosis, which is not cited to bring out any superior diagnostic ability on my part, but to show how careful one must be when dealing with any infection in a district where anthrax is known to have existed.

As to the prognosis and treatment we will now quote from the statistics kindly collected for us by Dr. Boyd.

Treatment: Dr. T. M. Legge. *The Lancet,* 1905.

Mortality generally 25%. In early cases as soon as local center of infection has been removed or destroyed there is a rapid fall in temperature, the edema disappears, and menace to life is over, though several days may elapse before glandular swelling disappears. Fatal cases are those in which excision is practiced late, and in which symptoms are severe.

Ipecac has been used locally in 50 cases without fatal result. Injection of carbolic acid around pustule in 50 cases with 2% of deaths. Another series of 384 cases were treated thus with 20 deaths (5%). Length of stay in hospital of cases of recovery where excision is practiced is from 15 to 20 days.

Up to 1905, 67 cases treated with Sclaro's serum had been reported, 56 treated with serum alone, and in 11 serum was subsequent to excision or cauterization or both. One case in each of these two groups was fatal, infection being on the face. In cases with recovery average duration of treatment was 8 days; greatest was 14 days.

Sclaro in 1903 tabulated all cases known to have been treated with serum in Italy, no matter in what stage of the disease. These totaled 164, with 10 deaths (6%), while during the same period in all the cases occurring in Italy the percentage was 24.1%.

Here are some of the claims for the serum treatment:

1. Innocuous in large doses.
2. Well borne even in intravenous injections.
3. No case in early stage or of moderate severity is fatal if treated with serum.
4. When injected into the veins the serum quickly arrests the extension of the edematous process.
5. Used early it reduces to a minimum the destruction of tissue at site of pustule.
6. In some locations, as eyelid, can be used in preference to any other treatment.
7. In internal anthrax it is the only treatment holding out any hope of benefit.

Injection of serum is followed by a rise of temperature often to over 105°, and with it an improvement in the general condition of patient.

Sclaro produces this serum by immunization of horses, first using attenuated, and later virulent anthrax bacilli. Dosage of serum is graduated, the initial dose usually being 40 c.c., but even larger initial doses are advocated.

The following statistics were taken from the reports of Anthrax Investigation Board, Bradford District, England (Dr. Enrich):

During 1910-11, 18 cases are reported, in 17 of which the anthrax bacilli were cultivated. Fourteen were external, with one death and 13 recoveries; 4 were internal and all 4 died. Serum was used in 7 cases, with recovery, the doses totaling from 80 to 190 c.c.

During 1911-12, 19 cases were treated, in 18 of which the bacilli was demonstrated. Of these 14 were external, with 3 deaths and 11 recoveries, and 5 were internal, with 5 deaths. Serum was used in three cases with recovery. Doses totaled from 80 to 180 c.c.

From the above statistics two points stand out prominently, viz.: the low mortality and the great claims made for the serum treatment. As regards the mortality, it must be remembered that these tables were taken in a country and locality where anthrax is prevalent at all times and is as common as typhoid is with us, and the mortality does not seem to be much greater according to some observers. As to the serum treatment it will be noticed by a study of these statistics that the mortality is about the same in all classes of cases under any of the treatments mentioned above. For instance, in one series of cases ipecac alone was used locally in 50 cases without one death. Again we find 384 cases treated by injection of carbolic acid around pustule with only 20 deaths, or about 5%, in contrast to a series of 67 cases treated with serum alone, or in conjunction with excision, etc., with two deaths. Again we find all the cases in Italy for a given period tabulated as receiving the serum treatment, with a mortality of 6%. In this country reliance is placed mainly upon excision and cauterization, the serum not being considered as efficacious as our foreign friends deem it, although it is my belief it should be used in every case, and our local druggists should be required to keep a fresh stock on hand all the time.

In conclusion, it would be rather difficult to select any one method of treatment from the cases quoted. In the case under discussion I am convinced that the bacilli had entered the blood stream before I saw it, and that all treatment would have failed. I think the damage in this case was done by insufficient cauterization following an incomplete excision. I am convinced that one will not inflict the necessary pain upon one's self that would be necessary for a thorough excision and cauterization, and that unless it is done most thoroughly it is better to let it entirely alone, and thus avoid opening avenues of entrance into the blood stream. Should I be called upon again to treat a case I would anesthetize the patient and use the actual cautery alone locally, and I would carry it deeply into sound tissue, and for a large area surrounding the lesion, should it, of course, be in a location where such treatment could be carried out. I would follow this with large doses of serum, and repeat frequently until patient's condition showed marked improvement.

If I could not practice cauterization I believe I would prefer to use ipecac and serum rather than to take chances with excision.